

Improvements to Television and Radio Program Control

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to an improved system and method of channel scanning in television and/or radio systems.

2. Description of the Related Art

10 Digital television can deliver hundreds of channels. Because of this, users need a simple and efficient method of navigating these channels. Electronic program guides (EPGs) address this problem to an extent. However, despite the relatively
15 sophisticated functionality provided by EPGs, it seems that people continue to 'hop' or 'surf' or switch through the range of available channels using their remote controls. This is commonly referred to as "zapping". That is, viewers simply use the 'program
20 up' and 'program down' controls. Hence, a viewer may look through many, many channels before deciding to stop and watch something. If that item, or program, on that channel fails to interest the viewer, they re-start their search. A difficulty with this is that
25 they have to re-scan many channels again.

Channel zapping on a digital television also suffers from the problem that it can take a perceptible time to decode and, possibly, decrypt incoming signals, such as MPEG, DVB, ATSC or ARIB streams. Some channel changes
30 inevitably involve the changing of receiver frequency or polarization. This means that the receiver has to begin demodulating a new radio frequency signal. These problems exist for all types of modulation, including COFDM, 8-

VSB, QAM, etc. This means that the user experiences a delay changing channels on a digital TV system, whereas an analog system changes channel almost instantly. This can be particularly annoying for the user if they have to
5 scan through numerous channels that they have already viewed.

BRIEF SUMMARY OF THE INVENTION

An object of the invention is to provide improved
10 channel scan functionality for television and digital radio.

According to one aspect of the present invention, there is provided a method for controlling channel changes in television or digital radio having a tuner
15 or receiver, the method involving monitoring channel change commands received over a zapping session during which channels are discarded; identifying discarded channels; and preventing the tuner or receiver from
20 returning to the discarded channels during the rest of the zapping session or unless it is determined that a program transmitted on the discarded channel has changed.

By preventing the tuner or receiver from returning to discarded channels that are of no interest to the
25 user, redundant channel selections are removed from the zapping process. Hence, if a user has already 'channel hopped' to a particular channel, and the same item or program is showing, then that channel will be excluded from the 'channel hopping' process during the zapping
30 session.

The step of identifying discarded channels may involve monitoring a time for which the viewer viewed the channel and on the basis of this, determine whether the channel is discarded. The method may further

involve setting a viewing time threshold for use in the step of determining whether the channel is to be discarded. Various options for using the threshold to determine whether or not a channel is to be discarded
5 may be employed. The choice of which option to use can be made by the viewer or be pre-determined. For example, the method may involve discarding the channel if the monitored viewing time is at most the viewing time threshold. Alternatively, if the monitored
10 viewing time is at most the viewing time threshold, then the channel may be retained. Alternatively if the monitored viewing time is at least the viewing time threshold, then the channel may be discarded. As a yet further alternative, if the monitored viewing time is
15 at least the set viewing time threshold, then the channel may be retained.

The step of identifying discarded channels may involve receiving from a user an indication of a program or item type that is to be discarded;
20 monitoring the type of program currently being provided on available channels and discarding those channels that are currently broadcasting programs or items of the type indicated by the user. The program type may be, for example, sports programs or current affairs
25 programs or advertisements.

The method may further comprise determining whether a program on a particular channel has changed. The method of determining whether a program has changed may involve comparing program identifiers for the
30 previously viewed program and the program currently available. In the event that there is a match, then it is determined that the program has not changed and so the channel is not re-introduced to a list of channels that are available for scanning. In the event that

there is not a match, then it is determined that the program has changed. In this case, the channel is re-introduced into the pool of channels that can be zapped to.

5 Additionally or alternatively, the step of determining whether a program on a particular channel has changed may involve monitoring real-time using for example a real time clock or timing information included in a broadcast; identifying program scheduling
10 information for a particular channel and using the scheduling information and real-time to determine whether there is a change in the currently broadcast program.

 The method may further involve receiving a control
15 signal from the user that indicates that a channel zapping session is starting, this signal prompting the start of the step of monitoring the channels zapped to and those discarded. This signal may be adapted so as to identify different users, so that, for example
20 different family members can start new zapping sessions. The method may further involve receiving from a user a signal that is indicative of a command to stop the channel zapping session.

 The method may involve terminating the channel
25 zapping session if no channel change commands are received over a pre-determined time.

 The method may further involve identifying an advertisement, temporarily excluding the channel that the advertisement is being shown on from the pool of
30 available channels and re-introducing the channel when the advertisement is finished. Alternatively, the method may involve identifying an advertisement and showing in place of the advertisement material, such as

a video clip or text, which is associated with the program that is to be shown when the advertisement is finished. The method may further involve recording a portion of the program being broadcast immediately
5 before the start of the advertisement and displaying this to the user during the advertisement. Of course, in this case, the method preferably involves checking that the same program is being continued after the advertisement is finished.

10 The method may further involve monitoring program changes; identifying the most recently provided or broadcast program and presenting the most recently provided or broadcast program to the user in response to a channel change command. In this way, the most
15 recently started programs are automatically given priority during the zapping session.

The method may further involve receiving channel change commands from a remote control unit.

According to another aspect of the present
20 invention, there is provided a system for controlling channel changes in a television or digital radio system having a digital tuner or receiver, the system comprising means for monitoring channel change commands received from a user over a zapping session during
25 which channels are discarded; means for identifying discarded channels; and means for preventing the tuner or receiver from returning to the discarded channels during the rest of the zapping session or unless it is determined that a program transmitted on the discarded
30 channel has changed.

The means for identifying discarded channels may be configured to monitor a time for which the viewer viewed the channel and on the basis of this, determine

whether the channel is discarded. The system may further include means for setting a viewing time threshold for use in the step of determining whether the channel is to be discarded. Various options for
5 using the threshold to determine whether or not a channel is to be discarded may be employed. These options include: discarding the channel if the monitored viewing time is at most the viewing time threshold; retaining the channel if the monitored
10 viewing time is at most the viewing time threshold; discarding the channel if the monitored viewing time is at least the viewing time threshold, and retaining the channel if the monitored viewing time is at least the set viewing time threshold. The particular option that
15 is to be used can be selected as desired by the designer of the system. Alternatively, means may be provided for presenting to a user the various options that are available and receiving a user selection of one of the options.

20 The means for identifying discarded channels may comprise means for receiving from a user an indication of a program or item type that is to be discarded; means for monitoring the type of program currently being provided on available channels and means for
25 discarding from the channels that are available for zapping those channels that are currently broadcasting programs or items of the type indicated by the user. The program type may be, for example, sports programs or current affairs programs or advertisements.

30 The system may further comprise means for determining whether a program on a particular channel has changed. The means for determining whether a program has changed may be operable to compare program identifiers for the previously scanned channel and the

program currently available. In the event that there is a match, then it is determined that the program has not changed and so the channel is not re-introduced to a list of channels that are available for scanning. In
5 the event that there is not a match, then it is determined that the program has changed. In this case, the channel is re-introduced into the list of channels that can be zapped to.

Additionally or alternatively, the means for
10 determining whether a program on a particular channel has changed may comprise means for monitoring real time; means for identifying program scheduling information for a particular channel and means for using the scheduling information and real time to
15 determine whether there is a change in the currently broadcast program.

The system may be adapted to receive a control signal from the user that indicates that a channel zapping session is starting, this signal prompting the
20 start of the step of monitoring the channels zapped to and those discarded. The system may be further adapted to include a receiver for receiving from a user a signal that is indicative of a command to stop the channel zapping session.

25 Means may be provided for terminating the channel zapping session if no channel change commands are received after a pre-determined time has elapsed.

The system may be further configured to identify an advertisement, temporarily exclude the channel that
30 the advertisement is being shown on from the pool of available channels and re-introduce the channel when the advertisement is finished. Alternatively, the system may be configured to identify an advertisement

and show in place of the advertisement material, such as a video clip or text, which is associated with the program that is to be shown when the advertisement is finished. The system may further include means for
5 recording a portion of the program being shown immediately before the start of the advertisement and displaying this to the user during the advertisement.

The system may be further configured to monitor program changes; identify the most recently provided or
10 broadcast program and present the most recently provided or broadcast program to the user in response to a channel change command.

The system may further include a remote control unit for generating and sending channel change
15 commands.

According to yet another aspect of the present invention, there is provided a set-top box for controlling channel changes in a digital television or digital radio system having a digital tuner or
20 receiver, the set top box being configured to monitor channel change commands received from a user over a zapping session during which channels are discarded; identify discarded channels; and prevent the tuner or receiver from returning to the discarded channels
25 during the rest of the zapping session or unless it is determined that a program transmitted on the discarded channel has changed.

According to yet another aspect of the present invention, there is provided a computer program
30 preferably on a data carrier or a computer readable medium, for controlling channel changes in a digital television or digital radio system having a digital tuner or receiver, the computer program having code or

instructions for monitoring channel change commands received from a user over a zapping session during which channels are discarded; identifying discarded channels; and preventing the tuner or receiver from
5 tuning to the discarded channels during the rest of the zapping session or unless it is determined that a program transmitted on the discarded channel has changed.

The code or instructions for identifying discarded
10 channels may comprise code or instructions for monitoring a time for which the viewer viewed the channel and on the basis of this, determining whether the channel is discarded. The computer program may include code or instructions for setting a viewing time
15 threshold for use in the step of determining whether the channel is to be discarded. Various options for using the threshold to determine whether or not a channel is to be discarded may be employed. The choice of which option to use can be made by the viewer or be
20 pre-determined. The computer program may be adapted to discard the channel if the monitored viewing time is at most the viewing time threshold or retain the channel if the monitored viewing time is at most the viewing time threshold or discard the channel if the monitored
25 viewing time is at least the viewing time threshold or retain the channel if the monitored viewing time is at least the set viewing time threshold. The code or instructions for identifying discarded channels may comprise code or instructions for receiving from a user
30 an indication of a program or item type that is to be discarded; monitoring the type of program currently being provided on available channels and discarding those channels that are currently broadcasting programs or items of the type indicated by the user. The

program type may be, for example, all sports programs or current affairs programs or advertisements.

5 The computer program may further comprise code or instructions for determining whether a program on a particular channel has changed. The code or instructions for determining whether a program has changed may be operable to compare program identifiers for the previously scanned channel and the program currently available. In the event that there is a match, then it is determined that the program has not changed and so the channel is not re-introduced to a list of channels that are available for scanning. In the event that there is not a match, then it is determined that the program has changed. In this case, 15 the channel is re-introduced into the list of channels that can be zapped to. Additionally or alternatively, the code or instructions for determining whether a program on a particular channel has changed may comprise code or instructions for monitoring real time; 20 identifying program scheduling information for a particular channel and using the scheduling information and real time to determine whether there is a change in the currently broadcast program.

25 The computer program may be adapted to receive a control signal from the user that indicates that a channel zapping session is starting, this signal prompting the start of the step of monitoring the channels zapped to and those discarded. The code or instructions may be further adapted to receive from a user a signal that is indicative of a command to stop 30 the channel zapping session.

The code or instructions may involve terminating the channel zapping session if no channel change commands are received over a pre-determined time.

The code or instructions may be operable to identify an advertisement, temporarily exclude the channel that the advertisement is being shown on from the pool of available channels and re-introduce the channel when the advertisement is finished. Alternatively, the code or instructions may be operable to identify an advertisement and show in place of the advertisement material, such as a video clip or text, which is associated with the program that is to be shown when the advertisement is finished. The computer program may be operable to cause a portion of the program being broadcast immediately before the start of an advertisement to be recorded and display portion of the program to the user during the advertisement.

The computer program may be further adapted to monitor program changes; identify the most recently provided or broadcast program and cause the most recently provided or broadcast program to be presented to the user in response to a channel change command.

BRIEF DESCRIPTION OF THE FIGURES

Various aspects of the invention will now be described by way of example only and with reference to the accompanying drawings, of which:

Figure 1 is a block diagram of system that has an enhanced channel zapping capability;

Figure 2 is a flow diagram of the steps for switching into the enhanced channel zapping mode;

Figure 3 is a flow diagram of a top level process of the enhanced channel zapping capability;

Figure 4 is a flow diagram of a part of the process of Figure 3, and

Figure 5 is a flow diagram of a portion of the process of Figure 4.

DETAILED DESCRIPTION OF THE INVENTION

5 Figure 1 shows a digital television 10 that includes enhanced channel-zapping functionality. The system of Figure 1 has a tuner 12, which is responsible for picking out the correct broadcast signal from the attached antenna 14 or cable distribution system.
10 Connected to the tuner 12 is a demodulator 16 for producing a digital bit stream from the received signal. Connected to an output of the demodulator 16 is a meta-data extractor 18 for extracting, from the demodulated bit stream, a digital description of the TV
15 channels included in that bit stream, as well as the TV programs and/or items that are currently being or are scheduled to be broadcast. This 'digital description' (or meta-data) can include any one of a number of program identifiers. These will be described in more
20 detail later. After the meta-data extraction stage, the signal is passed to a video channel selector 20, which selects from the bit stream the desired digital TV channel. Connected to the video selector 20 is a video rendering module 22 for converting the selected
25 digital TV channel signal to a viewable format. The output of the video-rendering module 22 is input to a display 24, which is typically a television screen.

 In order to control channel changes, a channel change mechanism 26 is provided. This is connected to
30 and controls the tuner 12 and the video channel selector 20 to ensure that the selected TV channel is received, decoded and displayed. The channel change mechanism 26 receives channel change commands from a channel change mode switcher 28. The channel change

mode switcher 28 receives control signals from a remote control signal receiver 30, which in turn receives channel change signals from the user via a remote control signal transmitter 32, as shown.

5 Alternatively, signals may also be received from "up" and "down" channel change controls on the front panel of the television.

Connected to the channel change mode switcher 28 is an enhanced zap mechanism 34. This includes
10 software for implementing enhanced zapping functionality. In addition to forwarding routine channel changes to the channel change mechanism 26, the channel change mode switcher 28 is operable to switch an enhanced zap mode on and off. When the enhanced zap
15 mode is on, channel change commands are forwarded to the enhanced zap mechanism 34, instead of directly to the channel change mechanism 26. Associated with the zap mechanism 34 are a (digital) memory 36 for storing the pool of channels that are available during the
20 channel zapping session and a digital clock 38. To switch between the different mechanisms, the channel change mode switcher 28 is responsive to commands received from the user.

Figure 2 shows the steps taken when the television
25 is switched on initially. As is standard, the receiver 12 is powered-up 40; initialized 42; a list of available channels is identified 44, and the display 24 is initialized, i.e. the initial channel is picked and displayed on screen 46. The receiver 12 is then ready
30 to receive channel change commands from the user. This can be done in two modes, these being "normal" and "enhanced zap". Typically, the default is the normal mode, with the enhanced zap mode being activated in response to a user command.

To allow the generation of the "enter enhanced zap" command, the remote control is adapted to be able to send an enhanced zap control signal, which when received is recognized by the channel change mode
5 switcher 28 and causes the enhanced zap mechanism 34 to be activated. Typically, the remote control 32 will have a dedicated enhanced zap button and the system is set up so that the enhanced zap button on the remote control is able to toggle between the enhanced zap mode
10 and the normal mode. Optionally, this enhanced zap button may be operable to effect channel change commands for receipt by the enhanced zap mechanism, by for example being configured to have the effect of a 'channel up' button. Alternatively, another zap button
15 may be provided to have the effect of a channel change button, typically a 'channel up' button.

When the television is switched on initially and the enhanced zap mode is off, the channel change mode switcher recognizes 48 that the mode of operation is
20 the normal mode. Operation is then commenced 50 in the normal mode. In this mode, signals from the remote control unit are relayed via the channel change mode switcher 28 to the channel change mechanism 26, which causes the channel to be changed, as is normal.
25 However, when the enhanced zap mode is activated, the channel change mode switcher 28 recognizes this as a switch mode command 52 and so switches to the enhanced zap mode 54. Once this is done, signals from the remote control unit are relayed by the channel change
30 mode switcher 28 to the enhanced zap mechanism 34. The user can change 56 from enhanced zap mode at any stage by causing the appropriate mode command to be sent. This causes the mode switcher to switch to the normal mode.

Details of the functionality provided by the enhanced zap mechanism will be described in more detail with reference to Figures 3 to 5. In essence, however, when the enhanced zapping mode is activated, channel change commands are not passed directly to the channel change mechanism 28, but instead are sent via the enhanced zap mechanism 34. The zap mechanism 34 is operable to receive and monitor channel change commands received from the user over a zapping session. Using pre-determined criteria, the enhanced zap mechanism 34 determines which channels are of no interest to the user. In the event that the user re-starts the channel scan within the same zapping session, the enhanced zap mechanism 34 only passes on the change channel commands for those channels that have not been discarded. In this way, the enhanced zap mechanism 34 prevents the tuner or receiver from returning to the discarded channels during the rest of the zapping session or until it is determined that a program transmitted on the discarded channel has changed.

Various methods can be used to identify the programs that are of no interest to a viewer in a single channel zapping session and determine when the channels showing these programs can be re-introduced into the pool of channels available for channel hopping. In one case, the enhanced channel zapping mechanism 34 uses program, or item, identifiers. Modern digital TV transmission systems broadcast, or have the ability to broadcast, extra information concerning the current broadcast. This can include some form of digital description of the current broadcast, or a digital identifier for the program or item being broadcast. This identifier is synonymous with the program or item currently being broadcast, i.e. the

identifier unambiguously identifies the program or item. The channel zapping mechanism 34 is operable to monitor the identifier associated with channels that have been scanned and discarded by the user. This is
5 done using data provided by the meta-data extraction module 18. The enhanced zap mechanism then prevents the tuner 12 from being re-tuned to these channels until either a pre-set time has elapsed or the program identifier has changed.

10 A non-exhaustive list of identifiers includes the content reference ID (CRID) from the TV-Anytime forum; the instance meta-data identifier (IMDI) from the TV-Anytime forum; any URI, URN or URL as defined in any of the IETF RFC documents; the DAVIC/DVB URL format; the
15 DVB event ID; the SMPTE UPID and UMID and the ISO ISAN and V-ISAN.

In another method, it is possible to identify programs that are of no interest to a viewer and determine when the channels showing these programs can
20 be re-introduced into the pool of channels using event information tables (EIT). For DVB digital television, it is mandatory to transmit event information tables (EIT) to tell the DVB television receiver about the current and next item, event or program to be shown on
25 a DVB service. When the EIT is used in this way it is known as the 'present/following' table. Its primary use is to help with channel hopping. It allows an on-screen display to inform the user that, "Program A is on now," and, "Program B is on next." In this way, the
30 user can see, at a glance, what the service is showing at present and what it will be showing next. EIT information is available for all services in the DVB multiplex (that is, the transmitted MPEG transport stream). Also, present/following information is 'cross

carried' on other multiplexes of the same operator. Thus, on any particular platform, it is not necessary to re-tune to access the present/following information of a service carried within another multiplex.

5 In one method of enhanced channel zapping a list of all the DVB services that can be viewed is used. When the enhanced 'zapping' mode is engaged, information associated with the elements of this list is used to determine whether a service is available for
10 'zapping' or 'channel hopping.' When the mode is engaged and a channel is selected, a flag associated with that service is set. This flag represents that the channel has been zapped to. The present/following information for this service is noted. This service is
15 now not available for channel hopping until either the present/following information for this service changes or an optional time limit has expired.

 In the DVB method described above in-band signalling is used to determine whether the current program has
20 changed. In an alternative method, TV schedule meta-data can be used. That is, the data that is broadcast within the transport stream (TS) to allow the provision of an EPG. Examples of this data include DVB-SI, and the TV-Anytime Meta-data and Content Referencing specifications.
25 In this case, the digital TV receiver maintains a database of the current TV schedule. The digital TV receiver maintains an internal accurate clock based on data broadcast in the TS. Thus, the digital TV receiver is able to determine, in a time-based fashion, whether a
30 program is currently showing on air. In this case, when the enhanced zapping mode is engaged, information associated with the elements of this list is used to determine whether a service is available for zapping or channel hopping. When the mode is engaged and a channel

is selected, a flag associated with that service is set. This flag represents that the channel has been zapped to. This service is now not available for channel hopping until the digital TV receiver determines that a new
5 program is showing or an optional time limit has expired. As before, when channels are zapped to, and discarded, they are removed from the pool of channels that can be zapped to. These channels reappear in the pool of channels that can be zapped to as new programs appear on
10 them.

It is possible to extend the enhanced zapping functionality, from working at the program level, to also work at the program item or segment level. When channel hopping, the viewer may regain interest in a
15 channel if a new item is shown. For example, one news report may be of no interest, but the next may of interest. This is possible using the TV-Anytime Meta-data specification, which allows the broadcaster to signal that an advertisement is currently showing. If
20 the viewer zaps to a channel that is showing an advertisement and then moves to another channel before the main program resumes, then the viewer has not had the opportunity to assess whether or not the program is of interest. In this case, the channel should not be
25 removed from the pool of channels that can be zapped to.

In this implementation of the invention, the digital TV receiver maintains a list of the digital program identifiers for the programs or program items
30 showing on each of the digital TV services available. This method of enhanced channel zapping uses a list of all the digital TV services that can be viewed. When the enhanced zapping mode is engaged, information associated to the elements of this list is used to

determine whether a service is available for zapping or channel hopping. When the mode is engaged and a channel is selected, the digital program identifier for the program (or item) showing on this service is noted.

5 This service is now not available for channel hopping until a new program or item is showing (that is a new digital program ID is broadcast) or an optional time limit has expired. Thus, as channels are zapped to, and discarded, they are removed from the pool of channels
10 that can be zapped to. These channels reappear in the pool of channels that can be zapped to as new programs appear on them.

Each of the methods described above state that discarded channels reappear in the pool of channels that
15 can be zapped to as new programs appear on them. In a first further enhancement of the system, which will be referred to as further enhancement 1, these channels are given priority. Thus, if a new program or item appeared on a channel that was previously discarded, that channel
20 will be selected the next time the viewer changes channel. Priority will be given to the newest programs and items. Thus, if a new program or item appears on channel A and then, some time later, on channel B (where both channels A & B had been previously discarded)
25 priority will be given to channel B and then channel A. As mentioned before, the enhanced zapping functionality described herein can be achieved with a single 'zap' button, which would nominally have the effect of a 'channel up' button. When the first enhancement is
30 implemented, i.e. the system gives priority to new programs and items, hitting the zap button would signify that the user wishes to see new content rather than the next channel in the channel list.

As a further enhancement, which will be referred to as further enhancement 2, the system may be adapted to allow the user to define the criteria under which channels are discarded from and returned to the list of channels that can be 'zapped' to. For example, a time 'X' (in seconds) can be set by the user. A channel is only discarded if it is viewed for at least 'X' seconds. Otherwise, it is assumed that the channel was not properly assessed, for example because an advertisement was showing at the time. Also, an optional time limit 'Y' (in minutes) can be set by the user. Once discarded, a channel is always returned to the pool of channels that can be 'zapped' to after 'Y' minutes, the pool of available channels being stored in the memory 36 of Figure 1.

Alternatively or additionally, the system may be adapted to allow a user to discard particular types of program. This will be referred to as further enhancement 3. For example, the system may be operable to discard all sports channels or channels that are currently broadcasting sports programs. In this case, when a channel of a particular genre is discarded, all other channels showing the same genre of program can be discarded as well. Alternatively, rather than discard these channels altogether, the system may be operable to give them a lower priority than channels showing programs of other genres. In either case, when the single zap button is used, pressing that 'zap' button allows the viewer to channel hop to programs of other genres.

As a yet further enhancement, which will be referred to as further enhancement 4, if a channel is currently showing an advertisement, the enhanced zap mechanism 34 may be operable to temporarily remove this channel from the pool of channels that can be zapped

to. As soon as the advertisements have finished, the channel is restored, making it available for zapping (and, hence, more permanent removal from the pool of channels if discarded by the viewer). Another possibility is to show a stored clip of video when zapping to a channel that is currently showing an advertisement. In the case of an advertisement break within a program, the last minute or so of the program (before the break started) could be shown. In the case of a break between programs, the receiver could present a display of the digital description of the following program (the program meta-data). On the other hand, if it should be available to the receiver, a video clip from, or trailer for, the following program could be shown.

A more specific description of the methodology for implementing the invention will now be given with reference to Figures 3 to 5.

Figure 3 shows various steps for implementing enhanced zapping. These steps are all carried out in the enhanced zapping mechanism of Figure 1. When the channel-zapping mode is entered, the first step 58 is to determine the initial channel to which the tuner 12 has to be tuned and various set up parameters. The first of these set-up parameters is a value for the optional timeout T1. The system is designed so that for any discarded channel, after this optional timeout has expired, the channel is re-introduced into the pool of available channels. The timeout T1 can be set by either reverting to a default value stored in the memory 36 or by prompting the user to enter a value.

Once the optional timeout T1 is determined, it is established if new programs are to be given priority, i.e. whether further enhancement 1 is to be implemented.

Then, the type of timing that is to be used to determine whether or not channels are to be discarded is established, i.e. further enhancement 2, by either reverting to a stored value or by prompting the user to make the appropriate selection. If the "at least" option is chosen, then channels are discarded if they are viewed for at least the time set by the user. If the "at most" option is selected, then channels are not discarded if they are viewed for at most the set time. Once the type of timing is selected, then the duration of the viewing time T2 is set. Again a default or pre-set value could be used or the user could manually enter a value. Blocking of particular types of program can also be set up at this stage, i.e. further enhancement 3, as can the option to exclude channels that are showing adverts from the available channel pool, i.e. further enhancement 4. This set up routine can be done each time the user selects the enhanced zapping mode or alternatively, can be implemented using stored criteria.

Once the set-up parameters for the zapping session are identified, the tuner is tuned to the chosen channel 60. To do this, the channel zapping mechanism sends a command to the channel change mechanism to cause the tuner to change to the first channel chosen by the user. The timer is then set to determine the amount of time the user views that channel 62. Then the zapping mechanism waits for an event to occur 64. The events could be one of the following: expiry of the optional timeout T1; expiry of T2; a user input, such as a channel change command; end of program or item on an excluded channel; start of an advert on one channel in the channel pool; end of advert on one channel of the channel pool. Once an event is detected, it is processed 66.

Figure 4 shows the steps involved in the processing of an event, this processing being event dependent. The first step of this is to determine whether the event is expiry of T2 68. If it is then the next step 70 is for the zapping mechanism to determine the type of timing selected at set up. If the timing is "at most" then in the next step 72 it is determined that the current channel is not to be excluded when the next channel change is made. In contrast, if the timing is "at least", then the next step 74 is to exclude the current channel from the pool of available channels. Hence, the pool of available channels stored in memory 36 of Figure 1 is up-dated to reflect that the current channel is excluded. If the event is not expiry of T2, then it is determined in step 76 whether the event is timer T1 expiry for one channel. If the answer to this is yes, then at step 78 that channel is re-introduced to the pool of available channels. Again, the pool of available channels stored in memory 36 of Figure 1 is up-dated to reflect this.

If the event is identified at step 80 as being a channel change command, then the current channel is removed 82 from the available pool (if applicable) and the new channel is obtained 84. Figure 5 shows the steps for doing this in more detail. The zapping mechanism 34 firstly determines at step 102 whether the user input is a channel up or a channel down command. In the case where it is a channel up command, the new channel is identified in step 104 as being the channel in the pool of available channels that is immediately after the current channel. In the case where it is a channel down command 106, the new channel is identified in step 108 as being the channel in the pool of available channels that immediately precedes the current channel. If the user

input is identified at step 110 as being a "zap" signal, the zapping mechanism finds 112 the channel that is the newest addition to the channel pool, that is the channel that is showing the most recently started program or
5 item. In any case, once the channel change command is received and interpreted by the zapping mechanism 34, the final step 114 is to send the appropriate control signal to the channel change mechanism 26, which in turn sends a channel change command to the tuner 12.

10 Returning to Figure 4, if the zapping mechanism identifies at step 88 that the event is the end of a program or item on a channel excluded from the channel pool, then this channel is re-included 90 in the pool. If the zapping mechanism identifies 92 the start of an
15 advertisement on a channel in the channel pool, then this channel is temporarily excluded 94 from the pool. If the event that is identified is the end of an advertisement 96, the zapping mechanism re-introduces, at step 98, the channel to the channel pool.

20 In any case, after an event is processed, the next step 100 is to wait for further events. The above-described process of monitoring events such as user inputs and changes of television program and reacting to these events to change the pool of available channels
25 continues until the user exits the zapping mode and returns to a normal viewing mode.

Whilst the system 10 of Figure 1 is described as being included in a single self-contained enclosure such as a digital television, it will be appreciated
30 that the channel-zapping functionality may be built into a set top box. In this case, all elements of the receiver circuitry would be within the same enclosure, but the display would be provided within a separate unit, for example a television set.

The channel zapping mechanism of the present application uses the digital TV receiver to perform part of the channel hopping task. When channel hopping up and down, people are aware of what they have 'hopped to' in the past and go into 'fast thumb' mode. This invention exploits the digital data available in the broadcast to make the process easier.

The channel zapping method described herein allows the user to benefit from not having to 'channel hop' through channels showing programs (or program items) that the user is not interested in. This is particularly advantageous for digital television systems where the number of channels and channel change times are very much greater than for analog systems.

A skilled person will appreciate that variations of the disclosed arrangements are possible without departing from the invention. For example, whilst the description generally refers to programs being broadcast, it will be appreciated that other ways for transmitting these could equally be used. Also, whilst the invention has been described with reference to television, it will be appreciated that it could equally be applied to digital radio. Accordingly, the above description of a specific embodiment is made by way of example only and not for the purposes of limitation. It will be clear to the skilled person that minor modifications may be made without significant changes to the operation described.